

Start Detector Time Walk Compensation

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While much attention has been given to the accuracy of the time that received photons are detected, much less has been given to the timing accuracy of the transmitted laser pulse: the accuracy of SLR measurements depends on both. This is partly due to the fact that transmitted pulse shape and energy should be very stable and the response of, typically, a photodiode start detector, should be very repeatable from shot to shot. However since constant level discriminators are often used for defining the timing start event, there is potential for time “walk” to occur between shots if the transmitted laser pulse amplitude is subject to significant variations.

While all means to maintain constant laser pulse energy are taken, short and medium term fluctuations can occur. This paper describes a method to compensate for resulting time walk should transmitted laser pulse energy vary over time for whatever reason.

A relatively simple peak voltage monitor was developed to measure the peak amplitude of each start detector output pulse, which for Mt Stromlo SLR station occurs at 60Hz. The data from this monitor is added to the ranging data stream and included in post processing of both system delay calibrations and satellite range measurements.

Test results described in this paper indicate that excursions in the order of 1-2 mm resulting from laser beam variations can be successfully compensated using this technique.